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| 09/780,547 | 02/09/2001 | William L. Betts | 061607-1500 | 1557 |

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| EXAMINER | |
|---|---|
| WANG, TED M | |

| ART UNIT | PAPER NUMBER |
|---|---|
| 2634 | |

DATE MAILED: 03/08/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

| Office Action Summary | Application No. | Applicant(s) |
|---|---|---|
| | 09/780,547 | BETTS ET AL. |
| | Examiner | Art Unit |
| | Ted M Wang | 2634 |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *28 September 2004*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-65* is/are pending in the application.

4a) Of the above claim(s) *1-32* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *33-65* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *2/9/2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *9/28/04*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

## DETAILED ACTION

### *Response to Arguments*

1. Applicant's arguments with respect to claims 1-32 have been considered but are moot in view of the new ground(s) of rejection.

### *Claim Rejections - 35 USC § 112*

2. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

3. Claims 33-65 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

- With claims 33, 46, and 57, the limitation of "the sign of the point being selected by the convolutional code to avoid a bias in positive or negative levels" has not been taught in the specification. The specification teaches only " Note that the 12-PAM and 24-PAM mappings are constructed to maintain the same convolutional (trellis) code while avoiding a bias in positive or negative levels."
- With claim 35, 48, and 59, the limitation of "the same convolutional code generated by the trellis encoder when using the non-fractional encoder while avoiding a bias in the positive or negative level" has not been taught in the specification. The specification teaches only " Note that the 12-PAM and

24-PAM mappings are constructed to maintain the same convolutional (trellis) code while avoiding a bias in positive or negative levels."

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. Claims 42 and 64 are rejected under 35 U.S.C. 112, second paragraph, because the claims limitation, "a transmitter comprising: a receiver", has not been defined properly.

***Claim Rejections - 35 USC § 103***

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. Claims 33-37, 40, 42-49, 51, 53-60, 62, 64, and 65 are rejected under 35 U.S.C. 103(a) as being unpatentable over Brehmer et al. (US 5,251,236) in view of Betts et al. (US 5,684,834) and Eyuboglu et al. (US 5,875,229).

- With regard claims 33, 46, and 57, which are the related device and method and means function claims, Brehmer et al. discloses a transmitter, comprising:

  a pulse amplitude modulation (PAM) transmitter (Fig.1 elements 10, 12, 14, 16, 18, 20, 22, and 24 and column 3 lines 4-58) configured to transmit a point on signal space constellation (column 4 lines 14-60),

a trellis encoder (Fig.1 element 20 and column 3 lines 45-58) associated with the PAM transmitter configured to generate a convolutional code (column 2 lines 13-26);

a fractional encoder (Fig.1 elements 18, Fig.3 element 42, and column 2 lines 41-43) associated with the PAM transmitter, the fractional encoder configured to encode a non-integer number of bits for each word to produce an output symbol (column 3 lines 26-52 and column 4 lines 14-68).

Note that QAM is a form of PAM in which a plurality of bits of information are transmitted together in a pattern referred to as a "constellation". It is inherent that a QAM transmitter is a form of PAM transmitter.

Brehmer et al. discloses all of the subject matter as described above except for specifically teaching-

a) the signal constellation point representing at least one word (); and

b) a constellation encoder configured to map the point on the signal space constellation based upon the output symbol and the convolutional code,

c) the sign of the point being selected by the convolutional code to avoid a bias in positive or negative levels.

However, Betts et al. teaches that a) the signal constellation point representing at least one word (column 2 lines 34-67).

It is desirable to include the signal constellation point representing at least one word in order to improve the efficiency of the usage of a communication channel's bandwidth (column 2 lines 34-41).

Betts et al. further teaches b) a constellation encoder or a mapper (Fig.1 element 110 and Fig.6 elements 50 and 60) configured to map the point on the signal space constellation based upon the output symbol and the convolutional code (Fig.2, column 2 line 63 – column 3 line 2, column 3 line 43 – column 4 line 25, and column 5 line 43 – column 6 line 34).

It is desirable to a constellation encoder configured to map the point on the signal space constellation based upon the output symbol and the convolutional code in order to improve the efficiency of the usage of a communication channel's bandwidth (column 2 lines 34-41).

Therefore, It would have been obvious to one of ordinary skill in the art at the time of the invention was made to include the apparatus/method as taught by Betts et al. in which, a fractional encoder associated with the PAM transmitter, the fractional encoder configured to encode a non-integer number of bits for each word to produce an output symbol, into Brehmers' encoding circuit so as to improve the efficiency of the usage of a communication channel's bandwidth.

Brehmer et al. and Betts et al. disclose all of the subject matter as described above except for specifically teaching -

c) the sign of the point being selected by the convolutional code to avoid a bias in positive or negative levels.

However, Eyuboglu et al. teaches the sign of the point being selected by the convolutional code to avoid a bias in positive or negative levels (Fig.6 element 600, column 12 lines 25-65, and column 13 lines 9-23).

It is also desirable to include the sign of the point being selected by the convolutional code to avoid a bias in positive or negative levels in order to reduce the distortion introduced by the system (column 13 lines 9-16).

Therefore, It would have been obvious to one of ordinary skill in the art at the time of the invention was made to include the apparatus/method as taught by Eyuboglu et al. in which, the sign of the point being selected by the convolutional code to avoid a bias in positive or negative levels, into Brehmer et al. and Betts' encoding circuit so as to reduce the distortion introduced by the system.

- With regard claims 35, 48, and 59, which are the related device and method and means function claims, Brehmer et al. further discloses including a non-fractional encoder (Fig.1 element 20) that the constellation encoder as describer in the above paragraph is configured to map the point based on the same convolutional code generated by the trellis encoder when using the non-fractional (column 3 lines 26-58).
- With regard claims 36, 49, and 60, which are the related device and method and means function claims, Brehmer et al. further discloses the trellis encoder generates the convolutional code based upon at least one bit of each word independent of the remaining bits of each word (column 3 lines 30-58).
- With regard claims 37, Brehmer et al. further discloses that the at least one bit of each word used to generate the convolutional code bypasses the fractional encoder (Fig.1 element A1, A2, A6, and A6, and column 3 lines 26-58).

- With regard claims 40, 51, and 62, which are the related device and method and means function claims, Brehmer et al. further discloses including a fractional encoder table in communication with the fractional encoder (Fig.3 element 42, column 4 line 61 – column 5 line 13, and table 1); wherein the fractional encoder is configured to encode the output symbol based on the fractional encoder table (Fig.3 element 42, table 1, and column 4 line 61 – column 5 line 13).
- With regard claims 42, 53, and 64, which are the related device and method and means function claims, Brehmer et al. further discloses a receiver (Fig.2 and column 3 lines 65-68); and a fractional decoder associated with the receiver configured to decode a received symbol into a non-integer number of bits. (Fig.2 element 36).
- With regard claims 43, 54, and 65, which are the related device and method and means function claims, Brehmer et al. further discloses that the fractional encoder is a modulus (Fig.1 element 18 and column 3 lines 59-64).
- With regard claims 34, 47, and 58, which are the related device and method claims, Brehmer et al. disclose all of the subject matter as described above except for specifically teaching that

  a) collect an integer number of bits S*K, over a frame comprising several symbol periods S, and convert the S*K bits of the frame in to integers S,

  b) each of arithmetic base M, where M corresponds to a plurality of PAM signal levels, said PAM signal levels increasing in direct proportion to the values of the S integers.

However, Betts et al. further teaches that collecting an integer number of bits S*K (column 2 lines 59-62, where x=y $*2^C$, and y=S, and $2^C$ =K), over a frame (column 2 lines 59-62) comprising several symbol periods S (column 2 lines 59-62, where y=S).

It is desirable to collect an integer number of bits S*K, over a frame comprising several symbol periods S in order to improve the efficiency of the usage of a communication channel's bandwidth (column 2 lines 34-41). Therefore, It would have been obvious to one of ordinary skill in the art at the time of the invention was made to include the apparatus/method as taught by Betts et al. in which, collect an integer number of bits S*K, over a frame comprising several symbol periods S, into Brehmers' encoding device so as to improve the efficiency of the usage of a communication channel's bandwidth.

In addition, Betts et al. also teaches that each of arithmetic base M (where M is considered to be modulus as shown in Fig.16), where M corresponds to a plurality of PAM signal levels (Fig.15 and 16, and column 10 line 5 – column 11 line 31), said PAM signal levels increasing in direct proportion to the values of the S integers (Fig.15 and 16, and column 10 line 5 – column 11 line 31, where the QAM constellation signal point or modulus is the smallest integer, $m_2 >= 2^{\text{data rate/symbol rate}}$).

It is desirable to each of arithmetic base M, where M corresponds to a plurality of PAM signal levels, said PAM signal levels increasing in direct proportion to the values of the S.integers in order to improve the efficiency of the usage of a

communication channel's bandwidth (column 2 lines 34-41). Therefore, It would have been obvious to one of ordinary skill in the art at the time of the invention was made to include the apparatus/method as taught by Betts et al. in which, collect an integer number of bits S*K, over a frame comprising several symbol periods S, each of arithmetic base M, where M corresponds to a plurality of PAM signal levels, said PAM signal levels increasing in direct proportion to the values of the S integers, into Brehmers' encoding device so as to improve the efficiency of the usage of a communication channel's bandwidth.

- With regard claims 44, 45, 55, and 56, which are the related device and method claims, all limitation is contained in claims 34 and 47. The explanation of all the limitation is already addressed in the above paragraph.

8. Claim 38 is rejected under 35 U.S.C. 103(a) as being unpatentable over Brehmer et al. (US 5,251,236) and Betts et al. (US 5,684,834) as applied to claim 33 above, and further in view of Rhee et al. (US 6,233,712).

- With regard claim 38, Brehmer et al. and Betts et al. disclose all of the subject matter as described above except for specifically teaching that the trellis encoder is a feed-forward non-systematic convolutional encoder.

  However, Rhee et al. teaches that the trellis encoder is a feed-forward non-systematic convolutional encoder (Fig.3 elements 320, 322, and column 5 lines 15-67).

  It is desirable to have the trellis encoder that is a feed-forward non-systematic convolutional encoder in order to improve the signal-to-noise gain (column 5 lines

15-25). Therefore, It would have been obvious to one of ordinary skill in the art at the time of the invention was made to include the apparatus/method as taught by Rhee et al. in which, the trellis encoder that is a feed-forward non-systematic convolutional encoder, into Brehmer et al. and Betts' trellis encoder so as to improve the signal-to-noise gain.

9. Claims 39, 50, and 61 are rejected under 35 U.S.C. 103(a) as being unpatentable over Brehmer et al. (US 5,251,236) and Betts et al. (US 5,684,834) as applied to claim 33 above, and further in view of Goldstein et al. (US 5,822,371).

- With regard claims 39, 50, and 61, which are the related device and method claims, Brehmer et al. and Betts et al. disclose all of the subject matter as described above except for specifically teaching that including a PAM encoder table in communication with the constellation encoder; wherein the constellation encoder is configured to encode the point based upon the PAM encoder table. However, Goldstein et al. teaches that including a PAM encoder table in communication with the constellation encoder (Fig.2 element 68, appendix 1-3, Table 1), wherein the constellation encoder is configured to encode the point based upon the PAM encoder table (Fig.2 element 68, appendix 1-3, Table 1, and column 5 line 51 – column 8 line 10).

  It is desirable to include a PAM encoder table in communication with the constellation encoder; wherein the constellation encoder is configured to encode the point based upon the PAM encoder table in order to improve the signal-to-noise gain in order to reduce the required large computing and memory resource

(column 2 lines 59-61). Therefore, It would have been obvious to one of ordinary skill in the art at the time of the invention was made to include the apparatus/method as taught by Goldstein et al. in which, including a PAM encoder table in communication with the constellation encoder; wherein the constellation encoder is configured to encode the point based upon the PAM encoder table, into Brehmer et al. and Betts' trellis encoder so as to reduce the required large computing and memory resource.

***Conclusion***

10. Reference(s) US 5233629 is cited because they are put pertinent to the PAM transceiver with trellis encoder. However, none of references teach detailed connection as recited in claim.

11. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ted M. Wang whose telephone number is 571-272-3053. The examiner can normally be reached on M-F, 7:30 AM to 5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stephen Chin can be reached on 571-272-3056. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Ted M Wang
Examiner
Art Unit 2634

Ted M. Wang

SHUWANG LIU
PRIMARY EXAMINER